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The seven hundred and seventy-third Meeting of the Club was held in the Ante-Room, Sherfield Building, Imperial College, London S.W.7 on Thursday, 16 July 1987 at 6.15 pm. The attendance was 22 Members and 8 guests.

Members present were: Revd. G. K. McCULLOCH *(Chairman)*, Miss H. BAKER, Mrs DIANA BRADLEY, D. R. CALDER, S. J. W. COLES, J. H. ELGOOD, Revd. T. W. GLADWIN, B. GRAY, D. GRIFFIN, R. H. KETTLE, J. KING, I. T. LEWIS, Dr J. F. MONK, Mrs AMBERLEY MOORE, R. G. MORGAN, Mrs MARY N. MULLER, J. G. PARKER, R. E. F. PEAL, G. ROWE, R. E. SCOTT, N. H. F. STONE, and C. F. TURNER.

Guests present were: Mrs J. B. CALDER, R. K. COLES, Mrs J. M. GLADWIN, P. J. MOORE, C. A. MULLER, I. PROUD, R. RANFT and Commander R. D. M. W. THOMAS-FERRAND, R.N.

Mr R. E. Scott spoke on "Israel and its Birds". He illustrated his address with excellent slides, showing the various bird species, the distribution and ecology of which in Israel and adjoining countries he discussed.

The seven hundred and seventy-fourth Meeting of the Club was held in the Senior Common Room, Sherfield Building, Imperial College, London S.W.7 on Tuesday, 15 September at 7 pm. The attendance was 17 Members and 13 guests.

Members present were: Revd. G. K. McCULLOCH *(Chairman)*, M. ADCOCK, R. BEECROFT, Mrs D. M. BRADLEY, S. J. W. COLES, P. J. CONDER, J. H. ELGOOD, B. GRAY, D. GRIFFIN, I. T. LEWIS, Mrs A. MOORE, R. MORGAN, Mrs I. MULLER, G. ROWE, N. STONE, A. TANNER, and Dr A. TYE.

Guests present were: Lt-Col C. N. CLAYDEN *(speaker)*, Mrs ADCOCK, M. BOYLE, D. BRADLEY, Mrs J. BURNETT, Miss J. EDRICH, Mrs S. LEWIS, Mrs N. LIDELL, Mrs I. McCULLOCH, P. J. MOORE, C. A. MULLER, I. PROUD and Mrs H. TYE.

Lt-Col C. N. Clayden gave a very interesting talk on 'Birds on Ministry of Defence Property' illustrated with slides of a wide variety of habitats on M.O.D. property in England, Scotland and Wales. He showed how careful management of the land has significantly increased suitable habitats for many rare mammals, reptiles, insects and plants, as well as for birds.

Species status of the Malaysian three-toed kingfishers (*Ceyx*) – a re-assessment

by S. Dillon Ripley and Bruce M. Beehler

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For a number of decades there has been some uncertainty about the status of 2 Sundaic kingfisher populations of the genus *Ceyx*. *Ceyx erithacus** is marked with black and blue on the back and wings and, in general, ranges through the northern and western parts of southeast Asia. Its sibling form, *Ceyx rufidorsus* is pale rusty brown dorsally (with a lilac wash), and occurs, in general, to the south and east of *erithacus* (Fig. 1). In allopatry the 2 forms appear to be morphologically well-defined species. However,

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**Ceyx erithacus* is polytypic, with 4 subspecies (nominate, *macrocarus, motleyi, captus*). This follows Forshaw & Cooper (1983), who consider *rufidorsus* monotypic.

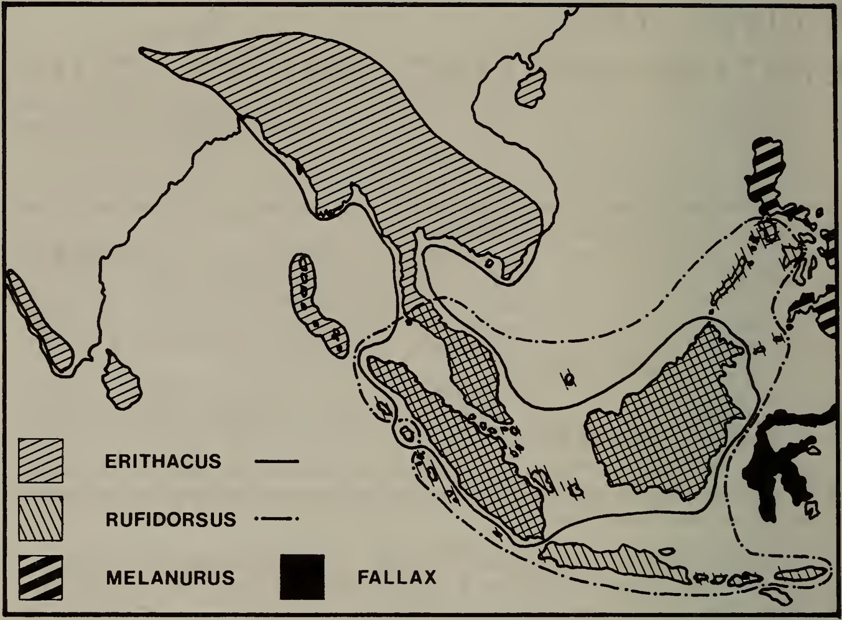

Fig. 1. Distribution of 4 species of *Ceyx* in southeast Asia. Note area of sympatry of *erithacus* and *rufidorsus* centring on Borneo, Sumatra and Malaya.

in Malaya, Sumatra and especially Borneo, both parental forms, as well as many intermediates, occur, with individuals exhibiting varying levels of similarity to one or the other parental form. Ripley (1942) presented an analysis of plumage characters in regional populations of these three-toed kingfishers, offering the opinion that, in spite of considerable levels of hybridization in sympatry, both taxa should be recognized as species.

Subsequent to this, the problem has been re-analysed with the aid of additional data, both by Voous (1951a, b), who tentatively supported Ripley's (1942) opinion and Sims (1959), who suggested that the 2 forms be considered conspecific.

Fry (1980), in his recent revision of the family Alcedinidae, treated the 2 taxa as conspecific, although he provided no discussion of the problem. In their monograph of the Coraciiformes, Forshaw & Cooper (1983), who followed Fry (1980) in most other opinions, chose, in this instance, to follow Voous (1951a, b) and Ripley (1942). Opinion seems to be divided throughout the literature. Those lumping the 2 include: Smythies (1960), Wolters (1976), Ripley (1982) and White & Bruce (1986). Those favouring splitting the 2 include: duPont (1971), Lekagul & Cronin (1974), King *et al.* (1975), Medway & Wells (1976) and Clements (1981).

For a number of reasons, including the clear ambivalence expressed in the literature, we believe that the *Ceyx erithacus/rufidorsus* problem should be reassessed. The analyses of Ripley (1942) and Voous (1951a, b) depended upon data that were incomplete, and although Sims was able to study large series of specimens, his analysis was hampered by some misconceptions about the biology of hybridization and a failure to interpret fully the data he had available.

Here we re-examine this 'species problem', and try to answer 4 questions: (1) Should *rufidorsus* and *erithacus* be treated as conspecific? (2) What is the origin of the pale-mantled Bornean population of *erithacus?* (3) What is the status of the single Sikkim specimen that is referred to *Ceyx rufidorsus* – far from its regular range? (4) Are systematic relationships of the endemic species of *Ceyx* from Sulawesi and the Philippines important for an understanding of the history of *erithacus* and *rufidorsus* in Sundaland?

Methods

In our study we excerpt and incorporate the abundant data of Sims (1959) with an additional set of 87 specimens studied from the collections of the National Museum of Natural History (Washington, D.C.) (NMNH), the American Museum of Natural History (New York) (AMNH) and the Bombay Natural History Society (BNHS). We were able to compare specimens from Sri Lanka, southwestern India, Sikkim, Thailand, Malaya, the Andaman and Nicobar islands, Sumatra, Java, Borneo, the Philippines and Lesser Sunda Islands.

Hybrids show a mixture of parental plumage characters or characters of an intermediate nature. Following the methods outlined by Sims (1959), we gave each of the 87 specimens a graded numerical value, based on the presence and extent of dark pigment in 4 areas: (a) forehead, (b) side of neck, (c) scapulars and (d) wing coverts. For each character the value ranges from zero for no dark pigment (pure *rufidorsus*) to 25 for maximum dark pigment (pure *erithacus*). Each specimen then receives a *total* character value (ranging from zero for pure *rufidorsus* to 100 for pure *erithacus*), simply the sum of the 4 individual character values. We then combined our graded data with those of Sims (1959: Fig. 1, p. 214).

Species status

For several reasons, we believe *rufidorsus* and *erithacus* are good species, in spite of the clear evidence for hybridization where the 2 populations come into contact. In Malaya, where both forms occur, the frequency distribution of pure parental types *vs.* intermediate forms (Fig. 2) indicates a tendency towards assortative mating. The 2 best-collected morpho-types in the area of overlap are the 'pure' or 'nearly pure' forms of *erithacus* and *rufidorsus* (coded 0-15, and 95-100 in Fig. 2), which account for 73% of the specimens analysed.

As noted by Sims (1959), because there is apparent migratory movement in Malaya by both *erithacus* and *rufidorsus*, the exact extent of breeding sympatry is unknown. Nests of both species have been recorded on the Peninsula (Chasen 1939), but there are too few nesting data to prove micro-geographic breeding overlap. Sims used this point to argue that significant sympatry did not occur. However, if *erithacus* bred only to the north and *rufidorsus* only to the south (allopatrically), then the sizeable number of intermediates we find on the Peninsula would be unexpected (Fig. 2). Both Riley (1938) and Lekagul & Cronin (1974) indicate that

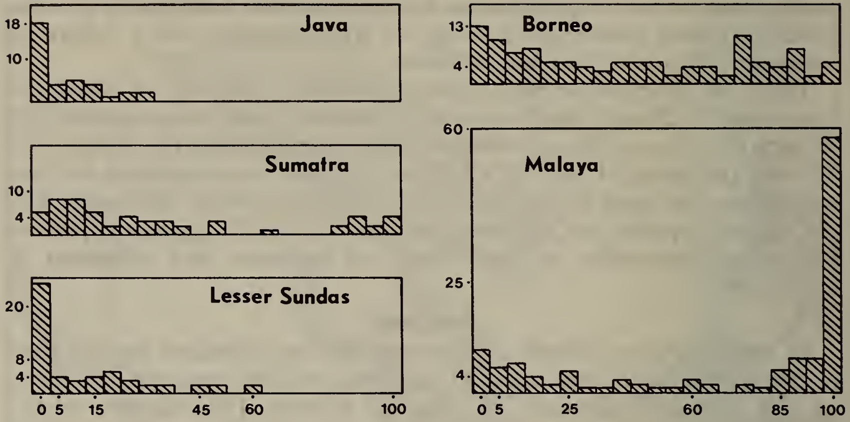

Fig. 2. Frequency distribution of specimens of *Ceyx rufidorsus* and *erithacus* showing parental and intermediate plumage characteristics, as measured by the technique of Sims (1959). Y-axis=number of specimens, X-axis=plumage coding (0=pure *rufidorsus*, 100=pure *erithacus*). See text for further explanation.

rufidorsus is resident as far north as Surat Thani (Bandon), implying that *erithacus* and *rufidorsus* share the southernmost 500 km of the Malay Peninsula.

We interpret the data from Sumatra as supporting our contention that 2 species are involved. Whereas specimens of hybrid origin are present in good numbers on Sumatra, the distribution of morphotypes shows a clear break (Fig. 2). To us, this implies that hybridization may no longer be occurring, with the populations tending to maintain the 2 parental forms, on the assumption that some sort of isolating mechanism has developed between the 2 forms on Sumatra. (Compare, especially, the distribution of intermediates on Sumatra with that on Borneo, where the situation is materially different.) Whether the Sumatra data 'prove' the specific status of *rufidorsus* and *erithacus* may depend on migration. Possibly *rufidorsus* breeds on Sumatra, while the specimens of *erithacus* are non-breeding vagrants or migrants. Birds in the Malay Peninsula are reported to breed in March and April (Chasen 1939), so the presence of *erithacus* in Sumatra in April, May, June or July would suggest they breed there; at present, however, we do not know of any specimens of *erithacus* from Sumatra during these breeding months.

For Java and the Lesser Sundas (Fig. 2), it is clear that, although *erithacus* genes continue to persist, pure *erithacus* no longer inhabits these islands, and the largest proportion of birds taken are pure *rufidorsus*. No hybrid specimens can be associated with true *erithacus*. To us, this evidence argues that in spite of one or more hybridization events having occurred previously on these islands, the presumably autochthonous form, *rufidorsus*, then out-competed the invading *erithacus;* but no true 'hybrid swarm' emerged, nor did a new 'single' form of 'hybrid origin' descend from the event. This too, supports our notion that both *rufidorsus* and *erithacus* are good species.

In supporting his claim that the high levels of hybridization between the 2 forms indicate they are conspecific, Sims (1959) cited for support the example of the *Melidectes belfordi/rufocrissalis* complex of honeyeaters of New Guinea, as outlined by Mayr & Gilliard (1952). Sims noted that this species-group hybridized extensively, and that Mayr & Gilliard treated the resulting forms as subspecies of *M. belfordi*. For 2 reasons this example does not serve Sims' argument well. First, subsequent treatments of the *Melidectes belfordi/rufocrissalis* problem have invariably determined that 2 species should be recognized (Gilliard 1959, Diamond 1967, Beehler & Finch 1985). Secondly, in a number of instances this hybridization event has produced "hybrid subspecies" – populations that are morphologically stable (e.g., *M. belfordi stresemanni*), but which are nevertheless unambiguously intermediate between the 2 parental forms. The *Melidectes* example, then, cannot be cited to support the lumping of the Malaysian three-toed kingfishers.

The Borneo Problem

In 2 respects, the situation in Borneo (Fig. 2) differs from that elsewhere: (a) intermediate forms far outnumber 'pure' parental types, and the data in Figure 2 imply a panmixia of the 2 forms in Borneo; (b) the Bornean *erithacus* (subspecies *motleyi*) differs from nominate *erithacus* in having a brown mantle, a character that otherwise would be attributed to *rufidorsus*. Sims (1959) failed to fully acknowledge this last curious fact; but we believe the subspecies *motleyi* is of hybrid origin, analogous to the above-cited example of the New Guinean honeyeater 'hybrid subspecies' *Melidectes belfordi stresemanni*.

We explain the Bornean situation as follows: (1) insular Borneo was originally occupied by a *Ceyx* population of already hybrid origin, perhaps a product of *erithacus/rufidorsus* contact on the expanded Sundaland during a period of low sea level (cf. Voous 1951a). This hybrid population was dominated by *erithacus* genes, but showed the pale mantle of *rufidorsus*. (2) More recently, Borneo has been reinvaded by pure *rufidorsus* (perhaps during another period of low sea level). (3) Unlike the Sumatran and Javan examples, neither parental form has come to dominate, and hybrid introgression seems to be occurring. This may, in part, be caused by the fact that both parental stocks carried *rufidorsus* genes. One might consider the Bornean example to be analogous to secondary contact between 2 subspecies, whereas at the other sites of re-contact the 2 parental populations are behaving like sibling species – with hybridization, but not introgression.

Rufidorsus in Sikkim?

We have examined the single specimen of *Ceyx rufidorsus* collected in the Sikkim terai, 22 July 1909, by C. M. Inglis, in the collection of the BNHS (see Abdulali 1964). It is pure *rufidorsus*, with a zero rating using Sims' method. Having examined the, apparently adult, specimen, we think it must have been a post-breeding migrant, possibly storm-blown up to the head of the Bay of Bengal by one of the typhoons that are common April-May and September-October (Ramdas 1974). Both *erithacus* and *rufidorsus* are known to disperse (migrate?) considerable distances in the non-breeding season, demonstrated by the remarkable number of instances of these forest-dwelling forms evidently becoming disoriented during dispersal and appearing in urban areas and on several instances flying into homes (cf. Chasen 1939, Abdulali 1964, Medway & Wells 1976). More information on the nature of the movements of *Ceyx rufidorsus* would be valuable.

Ceyx in Insular Southeast Asia

It is clear that the dark-winged *erithacus* is essentially a mainland southeast Asian form that also inhabits Pleistocene land-bridge islands (Borneo, Sumatra, Hainan, Sri Lanka) (Fig. 1). Exceptions appear to be the hybrid *erithacus* populations on Mindoro (Philippines), Nias (West Sumatran Islands), and the populations of pure *erithacus* on the Andaman and Nicobar islands, west of the range of *rufidorsus*.

By contrast, the pale-winged *rufidorsus* exhibits a primarily insular distribution, from Mindoro, Panay, Palawan, Tawi Tawi (Philippines), south to the Lesser Sundas and a number of the West Sumatran islands; but also the 3 Greater Sundas, as well as part of the Malay Peninsula.

We agree with previous authors who assume that *erithacus* evolved in allopatry somewhere on mainland southeast Asia, while *rufidorsus* evolved in allopatry somewhere in the islands – we would guess in the Lesser Sundas. Debate about which form is 'older', when considered in isolation from data on other Malaysian *Ceyx* species (cf Sims 1959: 217), is, we believe, fruitless. Since the presumption is that the 2 forms speciated allopatrically by the subdivision of a single parental form, the question "which is older?" is irrelevant – they are sibling species sharing a common ancestor. Including *Ceyx melanurus* of the Philippines and *Ceyx fallax* of Sulawesi (Fig. 1), 4 well-marked taxa – *fallax*, *melanurus*, *rufidorsus*, and *erithacus* – must have evolved from the ancestral *Ceyx* inhabiting southeast Asia. Morphological evidence (cf Fry 1980) points to early evolution of the Philippines and Sulawesi endemics, while *rufidorsus* and *erithacus* evolved later. That *fallax* and *melanurus* are closely related to the *rufidorsus*/*erithacus* complex seems indicated by the fact that in neither case have these forms achieved sympatry.

We believe that the best explanation for the present distribution of the genus *Ceyx* in insular southeast Asia will be developed from a comparison of 2 sets of data: first, the details of the cycle of rising and lowering of mean sea level that has occurred on at least 3 occasions during the last 200,000 years (Chappell 1974); second, examination of the Sundaic distributions of other comparable well-defined, forest-dwelling avian species groups. Such an analysis is beyond the scope of this paper.

Acknowledgements: We wish to thank the curators in charge of the collections at the AMNH, NMNH and BNHS for permission to examine material in their care. Mrs M. LeCroy kindly selected specimens for the loan from the American Museum.

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Notes on some birds of northeastern Brazil (2)

by Dante Martins Teixeira, Jorge B. Nacinovic & Francisco B. Pontual

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In the last few years we have accumulated new records on the distribution of northeastern Brazilian birds. This report follows Teixeira *et al.* (1986), q.v. and is also based on the field work performed by the Ornithological